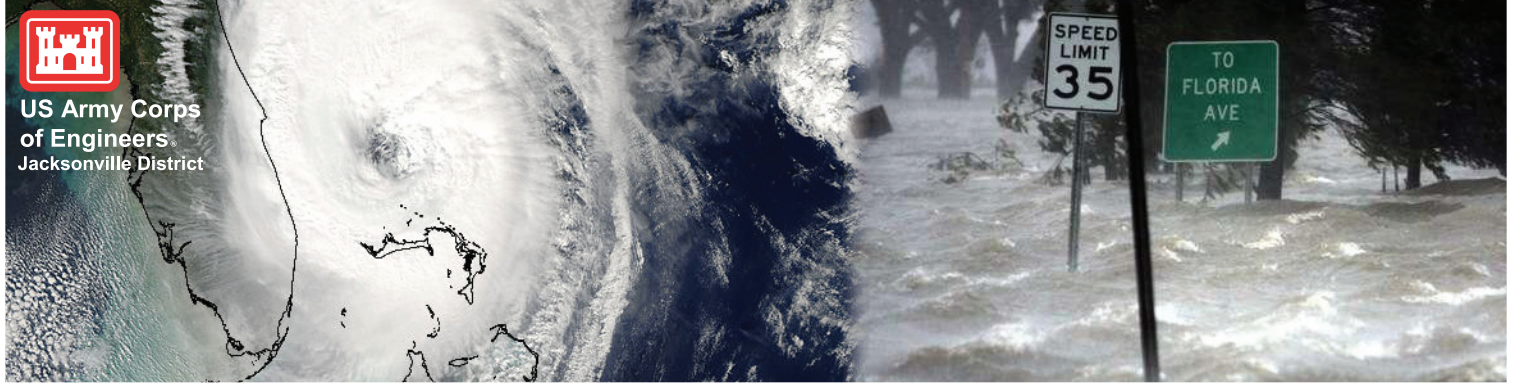


Herbert Hoover Dike and Lake Okeechobee

Hurricane Season 2008



US Army Corps
of Engineers
Jacksonville District

September 2008

Challenges of Herbert Hoover Dike and Lake Okeechobee

Safety First

The U.S. Army Corps of Engineers, Jacksonville District, has operated and maintained the Herbert Hoover Dike for 70 years with its highest priority being the continued safety of the communities surrounding Lake Okeechobee. To help maintain a safe dike, we regularly and methodically inspect and repair the embankment and water management structures on a regular basis.

The Corps also works closely with county emergency management offices on the development and implementation of local emergency action plans. We have communicated risks, providing flood inundation maps and timelines in the unlikely event of a breach. The Corps Jacksonville District and its south Florida offices also participated in state and county catastrophic planning conferences that include high lake levels and dike breach scenarios. We want you to understand the situation and risks involved, too.

Upon detection of a weakened condition at the dike, the Corps' Emergency Action Plan will be activated immediately. Our plan includes a formal notification process that moves in rapid order from the federal government, to the state, to the county emergency operations centers. The counties surrounding the lake will notify residents of any actions, such as evacuations, that should be taken.

Prepared for Emergencies

The Corps has identified trigger events that, if observed at the dike, would initiate emergency procedures. These procedures include emergency repairs of the dike, coordination of emergency warnings, and possible evacuation. The Corps' Emergency Action Plan includes stockpiling of 47,000 tons of armor stone in 20 locations and staging of equipment in multiple locations around the lake. We have immediate response teams located in Clewiston and more personnel identified from the Corps Jacksonville District to deploy at a moment's notice. We also have contracts in place for expert consultants, and additional manpower, equipment and materials.

Rehabilitation and Reducing Risk

The dike was originally built using materials dredged from the lake. These materials allow some seepage of water to pass through the dike; a normal characteristic of earthen dikes or levees. In the 1970s, a decision was taken to increase the upper limit of water

in the lake from Elevation 15.5 to 17.5 feet. The dike no longer functioned solely as a levee for flood damage reduction, but began functioning more like a dam containing a reservoir and providing water supply and recreation benefits. This changed dynamics because at this higher elevation, water pushes against the dike most of the time. With increased water levels, seepage began conveying sediment, a condition called piping. When water levels are too high, the additional pressure increases piping and internal erosion of the dike structure.



Inspections of the HHD and its structures is ongoing throughout the year.

We have taken measures to reduce risk:

- We have removed trees and excess vegetation from near the toe of the dike. The removal allows inspections of previously inaccessible areas, and enables earlier detection and repair of seepage-related distress. Because electric utility poles were compromising the integrity of the dike structure and obstructed planned dike rehabilitation, they were removed.
- We have addressed many areas in critical need of repair and portions of the dike are stronger today. We filled in areas to provide a filter to prevent seepage from removing dike foundation materials.
- In 2007, we began installing a partially penetrating cutoff wall in the dike. The cutoff wall serves as a barrier to water pathways, which can lead to internal erosion. This cutoff wall reaches from the top of the dike through the limestone bed-rock, about 60 feet below ground surface. We're constructing the cutoff wall in the most vulnerable areas of the dike.

In the event of an approaching storm, our contractors follow an established plan that ensures the safe maintenance of the dike and construction sites at all times. They may continue work but in incremental stages. Based on updated storm track information, the plan may call for the contractor to restore the dike to pre-construction conditions prior to arrival of the storm.

Maintaining Lake Levels and Safety Always

The Corps uses an operating schedule to maintain Lake Okeechobee target water levels between Elevation 12.5 and 15.5 feet throughout the year. This is considered a safe range for the dike structure and balances the multiple needs of South Florida, such as flood reduction, water supply, the environmental health of the lake and coastal estuaries, and recreational interests. The safety of dike directly correlates to the lake stage – the higher the lake, the greater the weakening of the dike and the potential for piping. Maintaining the lake within the 12.5 to 15.5 range is vital because extreme rainfall events can cause the lake to fill six times faster than waters can be released. One foot of rainfall in the Okeechobee / Kissimmee Basin can equal a three- to four-foot rise over several weeks in Lake Okeechobee. To return the lake to its original elevation after such a rain event, it would take us about 75 days at maximum flow. Using preferred flow or lower releases, which are less damaging to the coastal estuaries, it would take up to 230 days to return the lake to its original level. Depending on the situation, an extreme rain event can trigger too high of a lake level. If left unchecked, seepage could threaten the embankment.

There is limited potential for dike failure with lake elevations as low as 17.25 feet. As the lake level rises, so does the risk of dike failure. It could be a hurricane, a tropical storm or just lots of heavy rain, the risk increases significantly anytime the lake reaches above 18 feet. At about 18.5 feet, engineering studies say there is a 55-percent probability the dike will breach. Our modeling did not reflect human intervention — the new water management plan's flexibility to release waters in anticipation of a rain event or emergency repair actions.

During the drought period of the last two years, water levels were well below the Corps' normal operating range for Lake Okeechobee. This summer's rains began to bring lake levels slowly up, and then the lake rose swiftly following Tropical Storm Fay. Due to rainfall and drainage from the Kissimmee River basin, the total lake rise was over four feet in less than a month. The relatively quick rise of Lake Okeechobee is consistent with our expectations given the amount of rainfall in the basin.

The Corps controls releases through gated structures.



With a 4,000-square mile watershed, Lake Okeechobee's 720 square-miles can fill about six times faster than waters can be released.

While all surrounding factors continue to be monitored and assessed, the Army Corps of Engineers' intent is to store water coming into the lake within the 12.5 to 15.5 foot range. In part, our release decisions are based on conditions in the St. Lucie Canal and Caloosahatchee drainage basins. Water releases from the lake could potentially make flooding in these basins worse. Additional rainfall or projected rainfall will influence releasing water from the lake. If and when releases must be made, Corps water managers would prefer to release low flows into the St. Lucie and Caloosahatchee waterways. However, we make water management decisions based on a range of factors.

A decision about making releases will be governed by future conditions including how much water is in the basin and moving toward the lake, how far away another storm is, the speed at which it is moving, the amount of rainfall the storm is likely to produce, the likely wind speeds, and of course, the path of the storm. Our concerns also include current lake levels, inflow amounts, ground saturation and canal conditions, discharge capacities, coastal flood and environmental concerns and time of year. Therefore, an increase in lake level by an additional foot would not necessarily result in an 'automatic' release decision. It is situation dependent and based on many factors. Safety, however, is and always be our highest priority.

As the lake rises during the hurricane season of 2008, so will our inspections. If it reaches 16.5 feet, we will monitor the dike much more closely with daily inspections. The ongoing rehabilitation will continue to improve the integrity of the dike structure but we must all remain diligent because the rehabilitation is years from being completed.



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